Physics with Transforms

Wednesday, June 30, 2010
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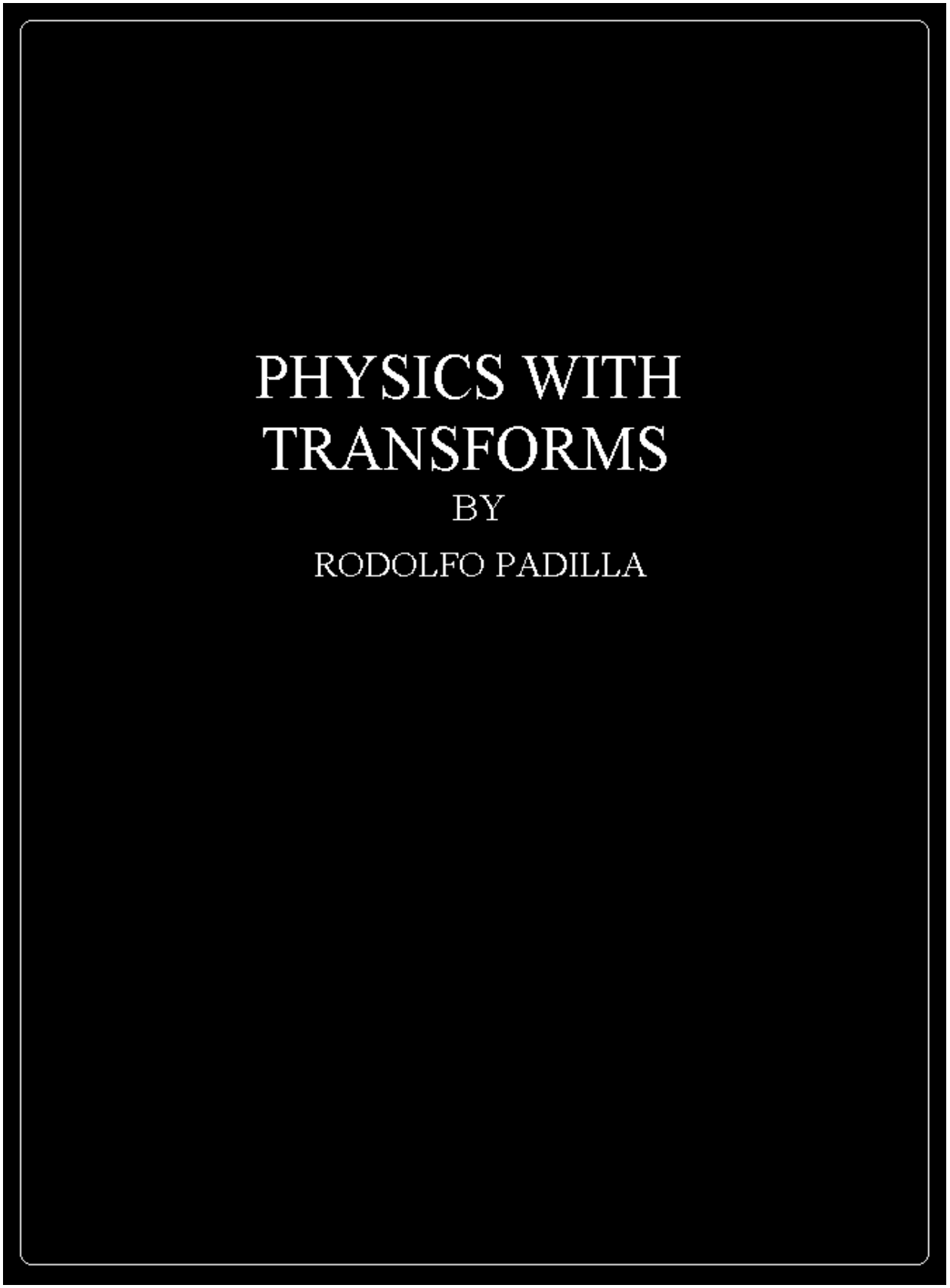
By Rodolfo Padilla Avalos



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Explanation & How-To Use

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EXPLANATION AND HOW TO USE: THE SCIENTIFIC CHART OF PHYSICS WITH TRANSFORMS.

The Scientific Chart has three columns: the column at the left are Experimental Installations, where formulas come from, these formulas form Ratios along the sides of the two Similar Triangles in the Geometric Diagram.

The column at the center are the Geometric Diagrams formed by two Similar Triangles, the value of the Ratios from the Experimental Formulas, are written near the vertex of its angle, and they are noted as in Mechanics: =F, =m, =a. Mathematically Ratios form Proportions where New Formulas are deduced.

The column at the right are the TRANSFORMS. The Transform is figured as a rectangular line, where outside up at the left is the Mathematical Operator $\mathcal{P}$, this operator is read as: "proportionally", it identifies only the Mathematical Procedure of the Transform.

Up inside in the Rectangle are the three Formulas taken from the Experimental Installation, inside down are the two Formulas derived from the mathematical transformation.

If You want to know the foundation and derivation of a Transform study the Geometric Diagram. The TRANSFORMS work like a Periodic Table of Physics. Formulas are grouped so You can memorize them easily.

The Table is mnemotecnic. Each Transform works sixteen formulas.

A cable hanging a bridge conducts force the same way a wire conducts electricity. Formulas are similar in a path of conduction. Conduction of gas, liquid, oil, heat, force, electricity, magnetism, light, radiation and so on.

In Mechanics You have the Force of pressure and pulling, and the gravitational Force which mantein the Universe in Equilibrium. In Thermology You have the Force of dilatation. In Electrostatics You have the Force of atraction, the same in Magnetism. Force produce Energy in its movement. The TRANSFORMS link these Forces.

You can get important fundamental formulas in Mechanics, Elasticity, Viscosity, Thermology, Thermodynamics, Electricity, Electrostatics, Electrodynamics, Electromagnetism, Electromagnetodynamics.

The Transform

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THE TRANSFORM.

This is the Mathematical Development of the TRANSFORMS. The Transform is a Formula that is applied to Physics: in the SCIENTIFIC CHART OF PHYSICS WITH TRANSFORMS.

$\mathcal{P}$ is a Mathematical Operator, and it is readen as: Proportionally the Five Formulas of the Transform are taken from the Two Similar Triangles in the Geomatric Diagram.

The Operator $\mathcal{P}$ distinguishes the Mathematical Procedure. The Letters are Lengths of Lines taken at a Scale of Magnitudes in a Metric System of Units.

The Five Formulas enclosed in a Rectangle form a Set Named and Identified by the Operator $\mathcal{P}$. The Operator $\mathcal{P}$ guides the mathematicl operation.

Formulas are connected by means of the Transforms, Energy and Force are related Mathematically through all the Formulas of the Physics Science.

This method of linking all Formulas of Physics is elegant and scientific, and mathematics are the beauty and essence of sciences; the Transform does the job.

The Five Formulas of each Transform works simultaneusly in the same experiment or application.

From the first three formulas of the Transform are deduced two more formulas.

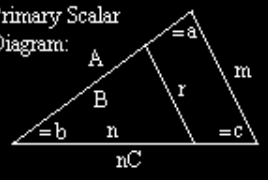
The Scienfic Chart of Physics with Transforms, works more than one hundred formulas.

The obverse of this page is the EXPLANATION OF THE SCIENTIFIC CHART OF PHYSICS WITH TRANSFORMS.

CIE graduate. 433 South Dr. Efren Ornelas.
Juarez, Chih. MEXICO.

TRANSFORMS. Foundation:

Primary Scalar Diagram:



Ratios of Similitude:

$$\frac{A}{m} = a, \quad \frac{B}{n} = b, \quad \frac{nC}{m} = c. \qquad (1)$$

The Proportion:

$$\frac{A}{nC} = \frac{B}{n}; \quad \text{from where:} \quad A = BC. \qquad (2)$$

Substituting (1) in (2) we get:

$$ma = nb\,\frac{mc}{n}; \quad \text{from where:} \quad a = bc.$$

$\mathcal{P}$

$$A = ma, \quad B = nb, \quad C = \frac{m}{n}c.$$

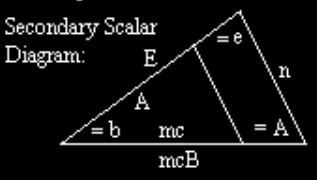
Primary Ecuations.

$$A = BC, \quad a = bc.$$

Secondary Ecuations.

Primary Transform

Secondary Scalar Diagram:



Combining: $A = ma$ and $a = bc$

gives: $A = mcb$ or $\frac{A}{mc} = b.$

Combining: $A = BC$ and $C = \frac{m}{n}c$

gives: $B = \frac{n}{mc}A$ or $\frac{mcB}{n} = A.$

The Ratios of Similitude are:

$$\frac{E}{n} = e, \quad \frac{A}{mc} = b, \quad \frac{mcB}{n} = A. \qquad (3)$$

The Proportion:

$$\frac{E}{mcB} = \frac{A}{mc} \quad \text{from where:} \quad E = AB \qquad (4)$$

Substituting: (3) in (4) we get

$$ne = mcb\,\frac{An}{mc} \quad \text{from where:} \quad e = Ab$$

$\mathcal{P}$

$$E = (n)e, \quad A = (mc)b, \quad B = \frac{n}{mc}A.$$

$$E = AB, \quad e = Ab.$$

Secondary Transform

Scientific Chart of Physics with Transforms - side 1

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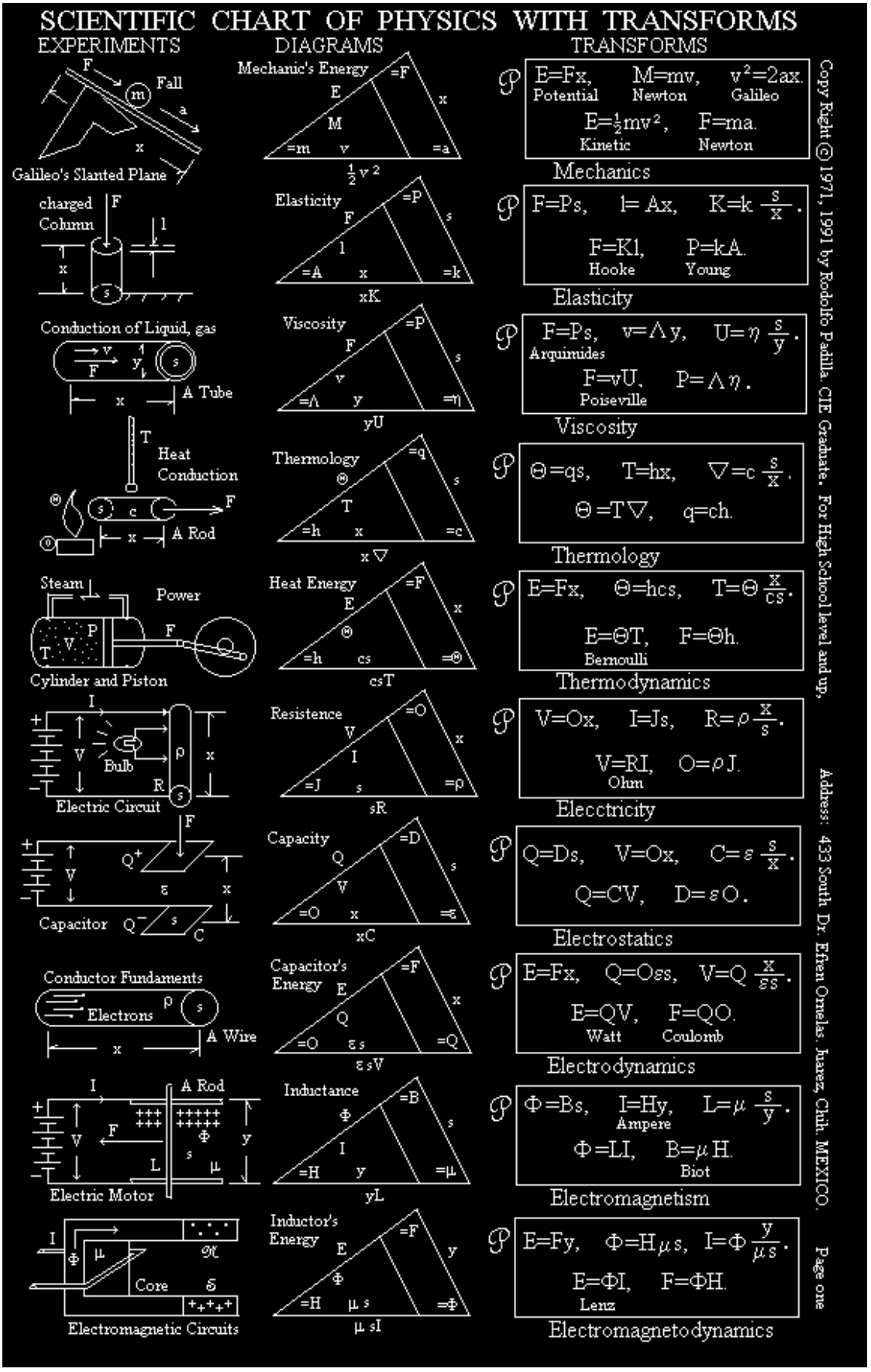

Scientific Chart of Physics with Transforms - side 2

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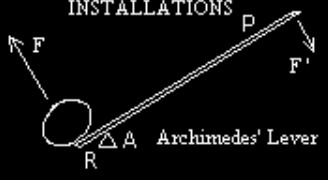
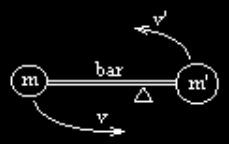
SYMBOL
MAGNITUDE, UNIT

1 E energy, joule
2 F force, newton
3 x length, meter
4 M momentum
5 m mass, kilogram
6 v speed
7 a acceleration
8 M torque
9 y length, meter
10 t time, second
11 τ period, second
12 P pressure
13 s area
14 l elongation, meter
15 A elastic gradient
16 K rigidity
17 k Young's modulus
18 f frecuency, cycle hertz
19 π pi: 3.141592654
20 λ wave lenght, meter
21 Λ viscous gradient
22 U viscosity
23 η viscous coefficient
24 ℘ specific density
25 r radio, metro
26 ℗ heat, calory
27 q thermic density
28 T temperature, degree
29 h thermic gradient
30 ▽ thermic conductor
31 c conductibility
32 V volume
33 I current, ampere
34 J electric density
35 V potential, volt
36 Q charge, coulomb
37 O electric gradient
38 R resistance, ohm
39 ρ resistivity
40 D electrostatic density
41 C capacity, farad
42 ε capacitivity
43 ϕ flux, weber
44 B magnetic density
45 H magnetic gradient
46 μ permeability
47 L inductance, henry
48 θ angle, radian degree
49 ω angular velocity
50 W power, watt
51 f focal distance
52 Γ atraction consstant
53 ε' atraction constant
54 μ' atraction constant
55 *sin* sin
56 *cos* cos
57 Σ sigma
58 ℘ mathematical operator

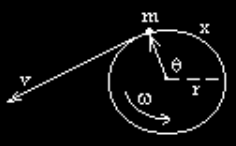
EXPERIMENTAL
INSTALLATIONS



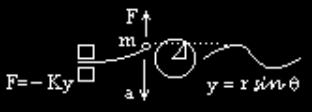
Archimedes' Lever



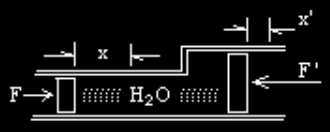
The Momentum



Circular Motion



Harmonic Motion

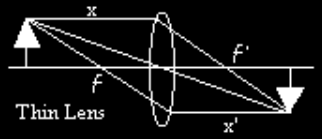


Pascal's Principle

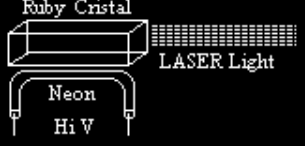

Thermoionic Tube Amplifier


Galena Crystal Detector

Newton's Glass Prism



Thin Lens



LAWS AND MATHEMATICAL
FORMULAS

Torque's Law: $F R = F' P = M$.
Kind at Center: ARP mnemotecnic.
A=Fulcrum, R=Resistance, P=Effort.
1st. 2nd. 3rd.

Statics

Momentum's Law: $mv = m'v' = M$.
Equilibrium's Law:
$$\Sigma F_{x,\,y,\,z} = \text{zero}.$$

Dynamics

Linear and Circular Motion:
$$v = \frac{x}{t}.\quad a = \frac{v}{t}.\quad \omega = \frac{\theta}{t}.\quad \alpha = \frac{\omega}{t}.$$

Kinematics

$x = \theta r$, $v = \omega r$, $a = \alpha r$, $\omega = 2\pi f$,
$f\tau = 1$, $c = 300000\,\mathrm{K\,m}$ $v = f\lambda$.

Circular Formulas

Boyle Mariotte's Law: $PV = P'V'$.
Charles Guy Lussac's Law: $\frac{V}{T} = \frac{V'}{T'}$.
General Law of Gases: $\frac{PV}{T} = ℗$.

Gases Laws

$F = \gamma' \frac{mm'}{r^2}$. $F = \varepsilon' \frac{QQ'}{r^2}$. $F = \mu' \frac{\phi\phi'}{r^2}$.
Newton. Coulomb.

Atraction Laws

Kirchhoff's Laws:
$V_1 + V_2 + \ldots + V_o = \text{zero}.$
$I_1 + I_2 + \ldots + I_o = \text{zero}.$

Potential & Current

$I = \frac{Q}{t}.\quad W = \frac{E}{t}.\quad ℘ = \frac{m}{V}.$
$\sphericalangle inc = \sphericalangle ref$ light's reflection law
density

Current & Power

$\frac{1}{f} = \frac{1}{x} + \frac{1}{x'}.\qquad \Xi = \frac{\sin\theta}{\cos\phi}.$
Gauss's Lens Law: Snell's Law:

Refraction of Light

$E = RI^2.\quad E = \frac{1}{2}LI^2.\quad E = \frac{1}{2}CV^2.$
$E = \frac{1}{2}KI^2$ circular
$E = 2m\pi^2 f^2 l^2$ ondulating

Energy Formulas

℘ is an Operator readen Proportionally the five formulas of the Transform are taken from the two similar triangles of the Diagram. See CHART OF MATHEMATICS.

Chart of Mathematics - side 1

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CHART OF MATHEMATICS

QUADRATIC EQUATIONS

PURE QUADRATIC: find roots:

$ax^2 + c = 0$ zero

$$x_1 = \sqrt{-\frac{c}{a}}, \quad x_2 = -\sqrt{-\frac{c}{a}}.$$

MIX QUADRATIC:

$ax^2 + bx = 0.$

Factorize: $x(ax + b) = 0$

$$x_1 = 0, \quad x_2 = -\frac{b}{a}.$$

COMPLETE QUADRATIC:

$x^2 + bx + c = 0$

Make: $b = m + n$ and: $c = mn.$

Find a pair of numbers such that:

$x^2 + (m+n)x + mn = 0.$

so: $x_1 = -m, \quad x_2 = -n.$

COMPLETING THE SQUERE:

$x^2 + bx + c = 0$ and do:

$$x^2 + bx + \left(\frac{b}{2}\right)^2 = -c + \left(\frac{b}{2}\right)^2$$

$$x_{1,2} = \pm\sqrt{\left(\frac{b}{2}\right)^2 - c} - \frac{b}{2}.$$

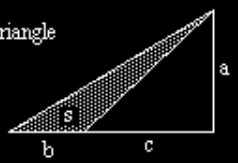
BY GENERAL FORMULA:

$ax^2 + bx + c = 0$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

AREA OF TRIANGLE

s area of triangle
a height
c cateto
b base



$$\frac{(b+c)a}{2} - \frac{ca}{2} = s$$

Solving and Simplifying:

$$\frac{ba + ca - ca}{2} = s$$

We arrive to the Formula of the Area of the Triangle:

$$s = \frac{ba}{2}$$

MATRICES

Simultaneous Equations:

Solve for: x, and y:

$ax + by = m$ (1)
$cx + dy = n$ (2)

Multiplying (1) by d,

and (2) by b: thus:

$adx + bdy = md$ (3)
$cbx + bdy = nb$ (4).

multiply by -1 (4)

to change the signs, thus:

$-cbx - bdy = -nb$ (5)

adding (3) and (5) gives:

$adx - cbx = md - nb$ (6)

expliciting x in (6) we arrive to:

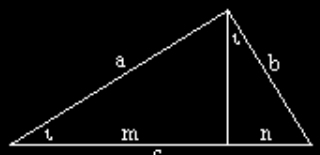
$$x = \frac{md - nb}{ad - cb}, \quad y = \frac{an - cm}{ad - cb}.$$

Algebraic Form

$$x = \frac{\begin{vmatrix} m & b \\ n & d \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}, \quad y = \frac{\begin{vmatrix} a & m \\ c & n \end{vmatrix}}{\begin{vmatrix} a & b \\ c & d \end{vmatrix}}.$$

Matrix Form

PYTHAGOREAN THEOREM



The Proportion: $\frac{a}{m} = \frac{c}{a}$

from where: $a^2 = mc.$ (1)

The Proportion: $\frac{b}{n} = \frac{c}{b}$

from where: $b^2 = nc.$ (2)

Also: $m + n = c.$

Adding (1) and (2) gives:

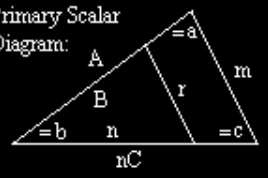
$a^2 + b^2 = mc + nc = c^2$

Therefore:
The Pythagorean Theorem is:

$$a^2 + b^2 = c^2$$

TRANSFORMS. Foundation:

Primary Scalar Diagram:



Ratios of Similitude:

$$\frac{A}{m} = a, \quad \frac{B}{n} = b, \quad \frac{nC}{m} = c. \quad (1)$$

The Proportion:

$\frac{A}{nC} = \frac{B}{n}$; from where: $A = BC.$ (2)

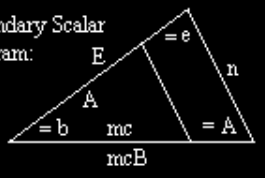
Substituting (1) in (2) we get:

$ma = nb\,\frac{mc}{n}$; from where: $a = bc.$

$\mathcal{P}$ $A = ma, \quad B = nb, \quad C = \frac{m}{n}c.$
Primary Ecuations.
$A = BC, \quad a = bc.$
Secondary Ecuations.

Primary Transform

Secondary Scalar Diagram:



Combining: $A = ma$ and $a = bc$

gives: $A = mcb$ or $\frac{A}{mc} = b.$

Combining: $A = BC$ and $C = \frac{m}{n}c$

gives: $B = \frac{n}{mc}A$ or $\frac{mcB}{n} = A.$

The Ratios of Similitude are:

$$\frac{E}{n} = e, \quad \frac{A}{mc} = b, \quad \frac{mcB}{n} = A. \quad (3)$$

The Proportion:

$\frac{E}{mcB} = \frac{A}{mc}$ from where: $E = AB$ (4)

Substituting: (3) in (4) we get

$ne = mcb\,\frac{An}{mc}$ from where: $e = Ab$

$\mathcal{P}$ $E = (n)e, \quad A = (mc)b, \quad B = \frac{n}{mc}A.$
$E = AB, \quad e = Ab.$

Secondary Transform

$\mathcal{P}$ is an Operator readen Proportionally the five formulas of the Transform are taken from the two similar triangles of the Diagram. See Chart of Physics. Page 1

Chart of Mathematics - side 2

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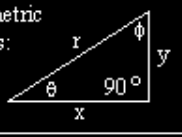
ALGEBRA

$5+5+5=3\times 5=15.$
$a+a+a=3\times a=3a.$
$(a+b+c)=(a+b)+c$
$=a+(b+c)=a+b+c.$
Associative Law of Addition.
$a+b+c+b=a+2b+c.$
$c-2c+3c+d=2c+d.$
$5-7=-2=-7+5.$
$-2-3-5=-10.$
$-e+d=d-e.$
$a+b=b+a.$
Commutative Law of Addition.
$-a-a-b=-2a-b.$
$-3+6-2=1.$
$-m+n+2m-3n=m-2n$
$a-(b+c)=a-b-c,$ or write:
$a-1(b+c)=a-b-c.$
$-4-(-3-2)=1$ or write:
$-4-1(-3-2)=1$ multiply:
$-4+(-1)\times(-3)+(-1)\times(-2)$
sum and solve: $=-4+3+2=1.$
$-f-(-g+h)=-f+g-h$
or write: $-f-1(-g+h)=$
$-f+(-1)(-g)+(-1)(+h)$
and solve: $=-f+g-h.$
$5\times 5\times 5=(5)(5)(5)=5^3.$
$a\times a\times a=aaa=(a)(a)(a)$
$=a\cdot a\cdot a=a^3.$
$abc=a(bc)=(ab)c=(ac)b$
Associative Law of Multiplication:
$-n^2=(-n)^2=n^2.$
$a+2b\times b-c=a+2b^2-c$
$ab=ba,\quad -ab=-ba.$
Commutative Law of Multiplication:
$-c(-b)=-(b)(-c)=bc.$
$a(b+c+d)=ab+ac+ad.$
distributive Law of Multiplication:
$d^1 d^2 d^3=d^{(1+2+3)}=d^6.$
$b^{-\frac{1}{3}}=\frac{1}{\sqrt[3]{b}}.\quad d^{\frac{1}{2}}=\sqrt{d}.$
$e^2 e^{-2}=e^0=1.$
$\frac{b}{b^{-2}}=b^{-1}=\frac{1}{b}.$

TRIGONOMETRY

Trigonometric Functions:



$\sin\theta=\frac{y}{r}.\quad \csc\theta=\frac{r}{y}.$
$\cos\theta=\frac{x}{r}.\quad \sec\theta=\frac{r}{x}.$
$\tan\theta=\frac{y}{x}.\quad \cot\theta=\frac{x}{y}.$

$\sin\theta=\csc\theta\tan\theta$
$\sin^2\theta+\cos^2\theta=1$
$\sin\theta=\cos\phi$
$\sin(90^\circ-\theta)=\cos\theta$
$\sin^2\theta=(\sin\theta)^2$

$\frac{a}{\sin\alpha}=\frac{b}{\sin\beta}=\frac{c}{\sin\gamma}$
Theorem of Sines.
$b^2+c^2-a^2=2bc\cos\alpha$
Theorem of Cosines.
$\frac{a-b}{a+b}=\frac{\tan\frac{1}{2}(\alpha-\beta)}{\tan\frac{1}{2}(\alpha+\beta)}$
Theorem of Tangents.

LOGARITHMS:

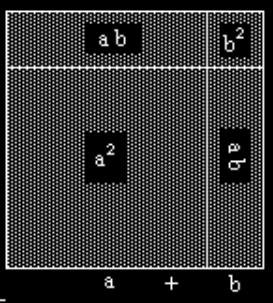
$10^3=1000$
3 is the *log* of 1000
1000 is the *antilog* of 3
Notation: $\log 1000=3.$

$10^1\times 10^2\times 10^3=10^6$
or: $10^{(1+2+3)}=10^6$
$\log 10=1,\ \log 100=2,\ \log 1000=3.$
$\log 10+\log 100+\log 1000=\log 10^6.$
$\hookrightarrow 1+\ \hookrightarrow 2+\ \hookrightarrow 3=\ \hookrightarrow 6.$
and: $antilog\ 6=1000000.$

$d\sqrt{\frac{c}{b}}=b:d=b\div d=\frac{b}{d}=b\,d^{-1}=c$

$\log ab=\log(ab)=\log a+\log b.$
$\log\frac{a}{b}=\log a-\log b.$
$\log d^{-m}=-m\log d.$
$\log a^3=3\log a.\quad \log\sqrt[3]{b}=\frac{1}{3}\log b.\quad \log g^{\frac{1}{n}}=\frac{1}{n}\log g.$

USEFUL BINOMIAL PRODUCTS



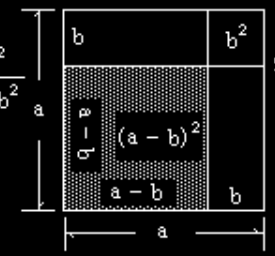
$\times\ \frac{a+b}{a+b}$
a^2+ab
$+\ ab+b^2$
$a^2+2ab+b^2$
Sum of two numbers squared:

RULES OF MULTIPLICATION:

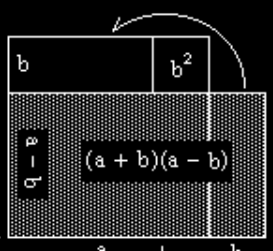
$(a+b)(a+b)=(a+b)a+(a+b)b$
or: $=a(a+b)+b(a+b)$
yields: $=a^2+2ab+b^2$
Expanded form:
$(a+b)(a+b)=(a+b)^2$
Factor form: Exponential form:

$\times\ \frac{a-b}{a-b}$
a^2-ab
$-ab+b^2$
$a^2-2ab+b^2$

b^2 is subtracted twice.



Diference of two numbers squared:



$\times\ \frac{a+b}{a-b}$
a^2+ab
$-ab-b^2$
a^2-b^2
Conjugate Binomials:

LAWS OF SIGNS:

(+1) x (+1) = (+1)
(+1) x (-1) = (-1)
(-1) x (+1) = (-1)
(-1) x (-1) = (+1)

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For High School and up.

GEOMETRY OF PHYSICS WITH TRANSFORMS

BY
RODOLFO PADILLA

Glossary - page 1

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SCIENTIFIC GLOSSARY:

1: PROPOSITION: is the enunciation of a: axiom, theorem, problem, law, hypotesis. Example: the three heights of a triangle intersects at one point.
2: AXIOM: is an evident truth, that it's evidence is the demonstration. Example: the school is greater, than one of it's classrooms.
3: THEOREM: is a fact that is evident only by means of a demonstration. Example: the three angles of a triangle sum 180° degrees.

4: POSTULATE: is an intuitive principle that is accepted with out can't be demonstrated. Example: the invariability of geometric figures.
5: LEMA: is a proposition to facilitate the demonstration of a theorem. Example: π pi is calculated by doubling the sides of a square and so on.
6: PROBLEM: is a question that must be solved. Example: relate the Energy formula E=Fx with the Power formula W=Vl.
7: SOLUTION: of a problem, is the indicated method to be solved. Example: derive Ohm's law by means a TRANSFORM.
8: HYPOTESIS: is a suposition. Example: mass contracts in the direction of it's movement.
9: COROLARY: is a consequence. Example: a perpendicular produces two right angles.

10: SCHOLIUM: is an observation. Example: the intersection of the medians in a triangle, is it's center of gravity.
11: DEMONSTRATION: are the proofs from reasoning for the conclusion. Example: the foundation of the TRANSFORM.
12: CONCLUSION: is what is deduced from the hypotesis by means of the demonstration. Example: the Thales' Theorem.
13: EXPERIMENT: is an installation in a laboratory to study and obtein scientific concepts.

Example: the Thermoionic or Edisson Effect.
14: THEORY: is a work with postulates and laws. Example: the transmission of light.
15: PREMISE: are axioms, theorems, or laws, needed for a demonstration. Example: two things equal to a third one, are equal between them.
16: OPERAND: is a quantity written with numbers and / or characters, or letters. Example; 57, 3a, der, a^2 , 2ab, b^2 , $3a^4 b$, e^3 , mn^5

17: TERM: is a quantity or an algebraic expression separated only by the plus + sign minus - sign or equal = sign. Example: =4aj+, -b+, -2dc=

18: ALGEBRAIC EXPRESSION: are operands and operators. Example: 33, 24xy, z, $a^2 + 2ab + b^2$.

19: TRANSFORMATION: is the conclusion or result of the operands and operators. Example: surface $s = a^2 + 2ab + b^2$.
20: FORMULA: is an algebraic expression. Example: $E = mv^2$.
21: EQUATION: are two algebraic expressions separated only by the equal = sign. Example: $y = mx + b$, $Ax + By + C = 0$.
22: ALGEBRA: is a sciencee that works with algebraic expressions and equalities. Example: $A = ma$, $B = nb$, $C = mn^{-1}$ c. $A = BC$, $b = bc$.
23: COEFFICIENT: is the number in a term. Example: $= 7a^4$, seven is the coefficient.
24: EXPONENT: is the power for what to be raised of an algebraic expression. Example: $2b^2$, $(ab)^3$, the small numbers two ^{2}, and three ^{3} are powers.

25: MONOMIO, BINOMIO, TRINOMIO: algebraic expressions of: one term, two terms, three terms.
26: OPERATORS: are the signs for what to do with the operands. Example: signs of operation as:

SIMBOL:	OPERATION:
+	To sum or add, plus sign, positive sign.
−	To substract, minus sign, negative sign.
÷ a/b	To divide, division's sign
x	To multiply, multiplication sign.
$\sqrt{}$	Root, square root, cubic root, ...
n	Number: 0, 1, 2, 3,.....-4,.....infinite ∞
n^p	Power, raise to a power: .....
log n	To take the Decimal Logarithm, Briggs.
ln n	To take Natural Logarithm, Napier.
(ab)	Association sign, parentesis.
=	Equal sign.
sin θ	sine function, trigonometry.
cos θ	cosine function, trigonometry.
tan θ	tg, tangent function, trigonometry.
θ	angle: degree, radian, grads.
$\mathcal{F}$	TRANSFORM: PHYSICS. Operator.
$\frac{a}{b}$	Fraction bar, for division.
∞	Infinite.

For High School level and up.

Algebra - page 2

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ALGEBRA: EXPLICITATION.
Muhammed-ibn-Musa Al-khowarizmi. Mathematician and Astronomer lived in Baghdad on IX century. Known for his book Al-jabr w'al-mukabalah, a Ttreatise on Algebra, means: Book of Equations and Simplification of Terms. Written about the yeaar 825, his dead about 850. Much of the logic concepts in algebra used today comes from: Al-khowarizmi.

FIRST LAW OF ALGEBRA: LAW OF EQUALITIES:
"Both sides or members of an equation must be done the same algebraic operations so both sides are always equal". This law is an axiom.

EXPLICITATION:
Each letter of this mathematical or algebraic expression: A = ma, may be explicited to get two more formulas. Let's explicit a in the formula:

Divide both members or sides of the equality by the quantity m applying law of equalities, thus:

$\frac{A}{m} = \frac{ma}{m}$ arrange: $\frac{A}{m} = \frac{m}{m}a$

observe that: $\frac{m}{m} = 1$ therfore: $a = \frac{A}{m}$

a has been explicit.

Explicit m in the same formula: divide both sides by a applying equality's law again, thus:

$\frac{A}{a} = \frac{ma}{a}$ or: $\frac{A}{a} = m\frac{a}{a}$

simplify: $\frac{a}{a} = 1$ and finally: $m = \frac{A}{a}$

m is explicit. The three formulas are:

$A = ma$ $a = \frac{A}{m}$ $m = \frac{A}{a}$

Explicit n in the formula: $C = \frac{m}{n}c$

multiply both sides by n thus: $nC = n\frac{m}{n}c$

arrange: $nC = \frac{n}{n}mc$ simplify: $nC = mc$

divide both sides by: C thus: $\frac{nC}{C} = \frac{mc}{C}$

arrange: $n\frac{C}{C} = \frac{mc}{C}$ finally: $n = \frac{mc}{C}$

n has been explicit.

DIVISION: LAWS OF DIVISION:
The division of two numbers gives other number called QUOTIENT or RATIO. Notations, and names of the parts of the division:

$$\begin{array}{r|l} \text{quotient} & \\ \text{divisor} & \text{dividend} \end{array} \qquad \frac{\text{numerator}}{\text{denominator}} = \text{ratio}$$

division notation fraction notation

$800 \div 125 = 6.4$ $84\,(2)^{-1} = 42$

arithmetic notation exponential notation

FIRST LAW OF DIVISION:
When the dividend and divisor are multiplied by the same number, the quotient is the same as before. Example;

$$\begin{array}{r|l} 1.3\dot{3} & \\ 5.25 & 7 \end{array} = \begin{array}{r|l} 1.3\dot{3} & \\ 525 & 700 \end{array} = \begin{array}{r|l} 1.33333\ldots & \\ 525 & 700.00000 \end{array}$$

This law is usefull for solving arithmetic fivisions.

SECOND LAW OF DIVISION:
When numerator and denominator are divided by the same number the ratio is the same as before. Example:

$$1.5 = \frac{3}{2} = \frac{\begin{array}{l}3\\9\\90\\270\\540\end{array}}{\begin{array}{l}\\\\\\360\\180\\60\\2\end{array}}$$

9 — divided by 10
270 — divided by 2
180 — divided by 3
6 — divided by 3

This law is usefull for simplification of fractions.

Simplify this algebraic expression:

$\frac{18\,a^2\,b}{3acd} = \frac{6ab}{cd}$

Ratios - page 3

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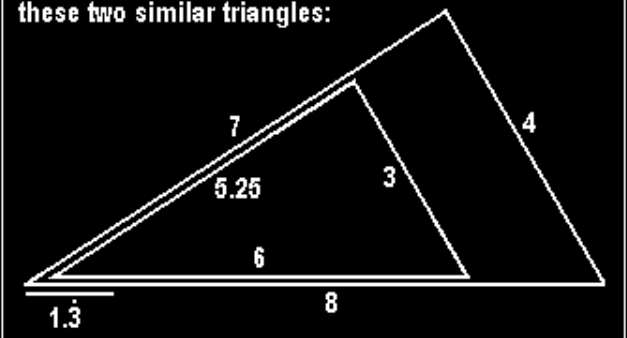
RATIOS AND PROPORTIONS:
Geometry are the pictures of Physics and Mathematics. Two Equal Ratios form a Proportion. PROPORTIONS are related with problems in arithmetic, algebra, physics, chemistry, and more.....
COMPUTE all measurements related to the sides of these two similar triangles:



The division of parallel sides have the same value of ratio for each set of similar triangles:

$\frac{8}{6} = 1.\dot{3}$ $\frac{4}{3} = 1.\dot{3}$ $\frac{7}{5.25} = 1.\dot{3}$

Observe that: $1.\dot{3} = 1.33333...$
Large sides divided by small sides have the same ratio: $\frac{8}{4} = 2$ $\frac{6}{3} = 2$

Middle sides divided by large sides give same ratio: $\frac{7}{8} = 0.875$ $\frac{5.25}{6} = 0.875$

Middle sides divided by small sides give same ratio: $\frac{7}{4} = 1.75$ $\frac{5.25}{3} = 1.75$

Make proportions equaring equal ratios:

$\frac{8}{6} = \frac{4}{3}$ $\frac{8}{6} = \frac{7}{5.25}$ $\frac{4}{3} = \frac{7}{5.25}$

$\frac{8}{4} = \frac{6}{3}$ $\frac{7}{8} = \frac{5.25}{6}$ $\frac{7}{4} = \frac{5.25}{3}$

You can commute nunerator with denominator:

$\frac{6}{8} = \frac{3}{4}$ $\frac{6}{8} = \frac{5.25}{7}$ $\frac{3}{4} = \frac{5.25}{7}$

$\frac{4}{8} = \frac{3}{6}$ $\frac{8}{7} = \frac{6}{5.25}$ $\frac{4}{7} = \frac{3}{5.25}$

to check for correctness of proportion: multiply cross sense, thus: 8 x 3 = 4 x 6.

Problems related with proportions:

1) Seven candies cost 4 cents, how much cost a box of 525 candies?
arrange data as a proportion format:

up candies — operation:

$\frac{7}{4} = \frac{525}{?}$ $\frac{525 \times 4}{7} = 300$ cents = 3 dollars.

down cents

or:

525 x 4 ÷ 7 = 300 cents = 3 dollars.

2) A car runs a mile in one and a half minute, how nuch time needs the car to cover 165 miles?

up miles

$\frac{1}{1.5} = \frac{165}{?}$ 165 x 1.5 ÷ 1 = 247.5 minutes.

down minutes

3) How many hours are 247.5 minutes? You know one hour is 60 minutes:

up hours

$\frac{1}{60} = \frac{?}{247.5}$ 247.5 x 1 ÷ 60 = 4.125 hours.

down minutes

4) How many minutes are in 0.125 of an hour? You know that 0.125 = 1/8 of an hour.

up hours

$\frac{1}{60} = \frac{0.125}{?}$ 0.125 x 60 ÷ 1 = 7.5 momites

down minutes

5) How long lasted the trip in hours minutes and seconds? You know half minute 0.5 are 60 seconds. The trip lasted:
4 hours, 7 minutes, and 30 seconds.

Similitude - page 4

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SIMILITUDE

PROOF OF RATIO OF SIMILITUDE:

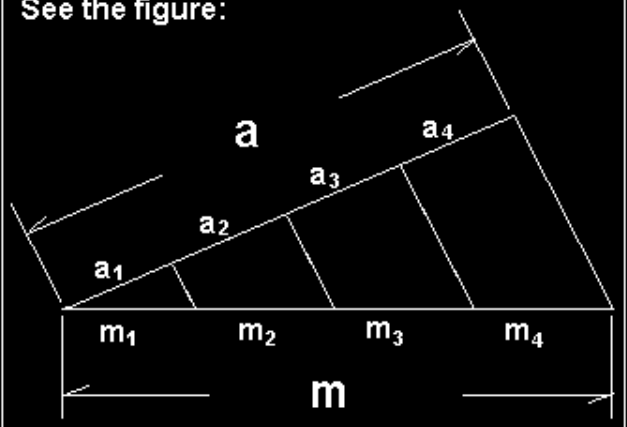
Thales, states that two triangles are similar when each of the angles of one triangle equals correspondingly to the angle of the other triangle.

This is a ratio, the distance a_1 divided by the distance m_1: $$r = \frac{a_1}{m_1}$$

r is the value of the ratio.

This is a ratio of similitude: $$r = \frac{a_1 + a_2}{m_1 + m_2}$$

See the figure:



The distances are equal so the rations are equal:

$$r = \frac{a_1}{m_1} = \frac{a_2}{m_2} = \frac{a_3}{m_3} = \frac{a_4}{m_4}$$

It is requiered to prove that:

$$\frac{a}{m} = \frac{a_1 + a_2 + a_3 + a_4}{m_1 + m_2 + m_3 + m_4} = r$$

and / or:

$$\frac{a}{m} = \frac{a_1}{m_1}$$

Proceeding as follows:

Starting with:

$$r = \frac{a_1}{m_1} = \frac{a_2}{m_2} = \frac{a_3}{m_3} = \frac{a_4}{m_4}$$

Equating each term in this way:

$r\ m_1 = a_1$, $r\ m_2 = a_2$,

$r\ m_3 = a_3$, $r\ m_4 = a_4$.

The sum of the right members of these equations are equal to the sum of the left members of these equations:

$$a_1 + a_2 + a_3 + a_4 = r\ m_1 + r\ m_2 + r\ m_3 + r\ m_4.$$

r is a common factor, then:

$$r\ (m_1 + m_2 + m_3 + m_4) = a_1 + a_2 + a_3 + a_4$$

expliciting r follows:

$$r = \frac{a_1 + a_2 + a_3 + a_4}{m_1 + m_2 + m_3 + m_4}$$

As has been seen:

$$a = a_1 + a_2 + a_3 + a_4$$

and:

$$m = m_1 + m_2 + m_3 + m_4$$

therefore:

$$\frac{a}{m} = \frac{a_1 + a_2 + a_3 + a_4}{m_1 + m_2 + m_3 + m_4}$$

also:

$$\frac{a}{m} = \frac{a_1}{m_1} = \frac{a_2}{m_2} = \frac{a_3}{m_3} = \frac{a_4}{m_4} = r$$

The ratio of similitude has been proven!

Euclid - page 5

Wednesday, June 30, 2010
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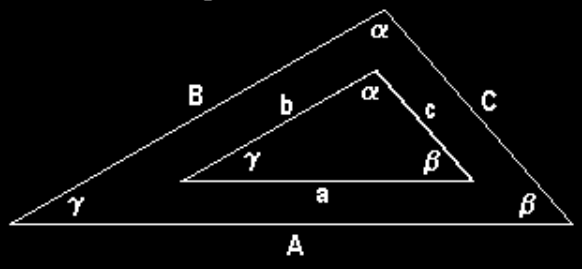
EUCLIDEAN GEOMETRY. SIMILAR TRIANGLES:
EUCLID, a Greek Mathematician lived on 365? to 275? before Christ. Famous for his Book of THE ELEMENTS a treatise on geometry, weitten on 330 before Christ. Geometry as we know today comes from EICLUD.
LAWS OF SIMILAR TRIANGLES:
Two or more triangles are similar when:



LAW OF ANGLES of similar triangles:
The ANGLES of similar triangles are correspondingly equal. That's all. This definition of similar triangles is sufficient. Correspondingly means that:
1) The value α of large angle of big triangle is equal to the value α of large angle of little triangle.
2) The value β of middle angle of big triangle is equal to the value β of middle angle of little triangle.
3) The value γ of small angle of big triangle is equal to the value γ of small angle of little triangle.

LAW OF SIDES AND ANGLES of similar triangles:
1) Large side is opposite to large angle.
2) Middle side is opposite to middle angle.
3) Small side is opposite to small side.

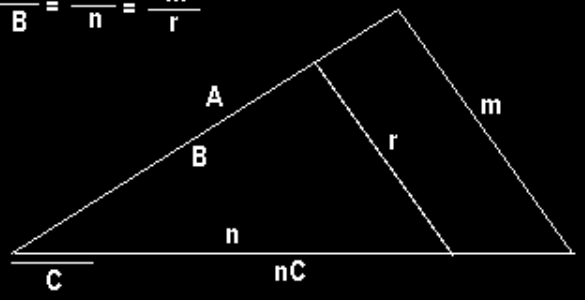
LAW ONE OF SIDES of similar triangles:
The SIDES of similar triangles are parallel. To do so: translate and or rotate one triangle. That's all. This definition of similar triangles is sufficient. Similar figures with parallel sides are HOMOTETIC.

LAW TWO OF SIDES of similar triangles:
The SIDES of similar triangles correspondingly have the same RATIO of QUOTIENT. That's all. This definition of similar triangles is sufficient. Correspongingly means that:
1) The length A of large side of big triangle divided by the lengt a of large side of little triangle have a ratio or quitient.
2) The length B of middle side of big triangle divided by the length b of middle side of little triangle have the same rato or quitient as before.

NEW PROOF OF THALES THEOREM:
THALES: Mathematician born 624? - 548? before Christ, in Samos island, near Miletus east of Mediterranean sea. Known as traditional extant until Plato 427 - 347 before Christ.

Prove or demonstrate THALES THEOREM: that the quitient or ratio, of the three parallel sides of two similar triangles, have the same value.
Prove or Derive that:

$$\frac{A}{B} = \frac{nC}{n} = \frac{m}{r}$$



Write valid mathematical proportions:

$$\frac{A}{m} = \frac{B}{r} \rightarrow \frac{A}{B} = \frac{m}{r}$$

$$\frac{A}{nC} = \frac{B}{n} \rightarrow \frac{A}{B} = \frac{nC}{n}$$

$$= \frac{A}{B} = \frac{nC}{n} = \frac{m}{r} = C$$

All quotients have the same ratio equl to =C.
The THALES THEOREM has been demonstrated.

Observe that the Geometric Diagram or figure, is the same of the page "The Transform", in the "SCIENTIFIC CHART OF PHYSICS WITH TRANSFORMS".

3) The length C of small side of big triangle divided by the length c of small side of little triangle have the same ratio or quotient as others sides.

SCHOLIUM:
1) Each set of similar triangles have it's own RATIO
2) Similar triangles are when correspondingly have two equal angles, the third angle automatically will be equal.

About Me - Rodolfo Padilla Avalos

Wednesday, June 30, 2010
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Physics with Transforms by Rodolfo Padilla

About Rodolfo Padilla Avalos

About the author:

RODOLFO PADILLA began to be acquainted with electronics since childhood. During elementary school he liked to make experiments with a box of little lamps, coils, transformers, wires, and batteries in a corner of his bedroom. He followed plans from books and magazines that his friends gave him. He liked to listen to the radio at bed time with a Galena Radio that he built, using the window screen as an antenna. He loved to build heterodyne circuits with electronic tubes.

During the next five years of middle and high schools he continued experimenting and building electronic projects, and loved mathematics. A teacher encouraged him to build a radiofrequency oscillator and to present it in the physics science fair. That year, 1955, he received his Bachelor's degree in Physics and Mathematical Sciences. He liked to make experiments and projects with transistors.

He graduated from the ESCUELA MEXICANA DE ELECTRICIDAD, receiving his degree as a radio and television technician in 1965. He continued studying and investigating more physics-related mathematics. On 1971 he published Physics with Transforms, a "treatise on conduction".

On 1980 he graduated from Cleveland Institute of Electronics (http://www.cie-wc.edu/)], receiving his degree in electronic engineering. On 1991 he published papers concerning experiments on electronic circuits. Chemistry with notes of all types of batteries, mathematics and physics. He continues making experiments and projects on electronics.

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Saturday, July 17, 2010
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